WEATHER, FORECASTS, AND WARNINGS FOR THE MONTH.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

July closed with a barometric depression over the Caribbean Sea within which two disturbances of slight intensity appeared. One of the disturbances moved northward between Santo Domingo and Porto Rico and thence to the Atlantic coast of the United States, attended along the middle Atlantic seaboard by heavy rains on the 4th and 5th, and the other passed over the Gulf of Mexico to the Texas coast with moderate to heavy rains in the middle and west Gulf coastal districts from the 4th to 8th. The rains that attended the Gulf disturbance verified a special forecast issued Thursday, July 29, in which the statement was made that rains would fall in middle and west portions of the cotton belt, where rain was needed, by the middle of the following week. The rains set in as scattered showers about the middle of the week referred to and became more general Friday and Saturday, and the precipitation for the latter half of the week aggregated about or slightly more than the normal weekly rainfall.

A cool wave that advanced from west of the Rockies over the Plains States and Missouri Valley from the 6th to 8th afforded temporary relief from high temperatures in the Middle West that had risen above 100° and had exceeded at some points any previous record for the season of the year. During the 8th and 9th temperatures were excessively high in the Eastern States and ranged from 92° to 98° in the lower Lake region, Ohio Valley, and Middle Atlantic States with highest reported readings, 98°, at Philadelphia and Baltimore on the 9th. The warm wave in the East was broken by an area of high barometer that moved eastward and southward from the Great Lakes during the 10th and 11th.

During the first decade of the month there was a decided lack of rain in the corn growing States of the Mississippi and Ohio valleys, and in the upper Mississippi Valley the drought had become severe. Rain was also badly needed in the middle Atlantic and New England States. On the 10th an announcement was made that the rains over the western portions of the cotton belt during the preceding two or three days would be supplemented during the succeeding several days by abundant rains in that section and generally over the Southern States. The rains set in as anticipated on the 12th and continued through the 13th. The following special forecast was issued Wednesday, August 11:

Present barometric conditions indicate that the prevailing drought in the Atlantic States from Virginia northward over Maryland, Pennsylvania, New York, and New England will be relieved in part by showers by the close of the present week and that more general rains will fall in the States referred to by the middle of next week.

A period of rainy weather that set in over the Middle Atlantic and New England States during the closing days of the week ending August 14 continued until the middle of the following week and in areas in those districts the rainfall was excessive. Two barometric depressions contributed to produce the rains. One advanced from the West from the 11th to 16th, and the other developed off the Carolina and Virginia coasts and moved northward attended by high winds from New Jersey to Maine.

On the 9th reports from Yucatan and the Mexican Gulf coast indicated the presence of a disturbance of marked intensity near or west of the northern point of Yucatan or in the Gulf of Campeche. By the following morning the center of the disturbance had apparently moved westward toward the Mexican coast in the vicinity of Tampico after which it appeared to pass inland north of Tampico and dissipate in heavy rains in the mountain districts during the 10th and 11th. During the presence of this storm over the western portion of the Gulf of Mexico, far from stations of observation, its course could not be determined. Shipping interests were however given information as definite in character as conditions warranted and with the appearance of the disturbance near Yucatan were advised that it was considered unsafe for vessels over central and western portions of the Gulf of Mexico. The westward advance of the storm center over the Mexican coast line and thence into the mountainous interior rather than along a normal northerly course can not be accounted for. By reason of the anomalous path it pursued, expected rough weather over the northwestern portion of the Gulf was not experienced and there was a less extensive distribution of general rains over the Southern States than was anticipated in a special forecast that was issued August 10.

On the 16th a disturbance appeared east of the Virgin Islands, W. I., moved rapidly thence on a northwest course, and apparently recurved during the 17th and 18th to the south and east of Bermuda. On the latter date another disturbance appeared off the Carolina coast and moved northward and then northeastward over the Atlantic without being severely felt at coast stations. Preceding the northward advance of this storm a disturbance that moved from the Lake region to the middle Atlantic coast caused excessive rains on the New Jersey and New York coasts, the precipitation at New York City for the twenty-four hours ending at 8 a. m. of the 17th being 5.04 inches. During the prevalence of the stormy conditions above referred to in eastern and southern waters a period of heat that for duration and intensity had been unequaled since 1901 prevailed in the Western States, and more particularly from the Great Plains over the lower Missouri and middle Mississippi valleys. The heat in the West was broken the night of the 17th and during the 18th, without the usual accompaniment of rain, and relief from the intense heat was had in the Southwestern States on the 19th.

Morning reports of the 18th indicated the presence of a disturbance to the eastward of the Island of Dominica, W. I. By 2 p. m. the center of the disturbance had advanced to a position south and east of St. Kitts and probably near Guadaloupe. West Indian ports were advised that the storm would move north of west and probably pass near the Virgin Islands and Porto Rico. By the morning of the 19th the storm center was south of and near Porto Rico and moving in a north of west direction. Afternoon reports of the 19th indicated that the center of the disturbance was approaching Santo Domingo and advices were issued to the effect that the storm would continue a west-northwest course toward the Bahama Islands. By the morning of the 20th the center had advanced over Santo Domingo and was apparently north of Port au Prince, Haiti, and by the following morning it had apparently recurved over the Atlantic beyond the region of observation.

Closely following this disturbance came a storm that showed marked intensity during its passage over the Caribbean Sea and the Gulf of Mexico and occasioned an enormous loss of life and property in northeastern sections of Mexico. This storm, or hurricane, appeared east-northeast of Barbados on the 20th and advices were then issued that it would probably move on a westerly course. By the morning of the 21st the center had advanced to the vicinity of Martinique, from which position it moved westward and on the morning of the 22d was central south of and apparently near Porto Rico. Vessel interests were advised as follows:

Hurricane of marked intensity near and south of Porto Rico moving westward. Dangerous for vessels over western West Indian waters during next several days.

On the 23d there appeared to be two cyclonic centers, one moving on a north of west course over the Windward Passage and another, a secondary or "twin" storm, south of Haiti. The

former evidently dissipated over the southern Bahamas or passed northward over the ocean without acquiring marked intensity and the other moved westward to a position off the southern coast of central Cuba by the 24th and reached the Yucatan Channel on the 25th. On the 23d the storm caused great loss of property on the Mole St. Nicholas, Haiti, many houses being wrecked by high easterly gales and by waves that rolled in from the bay. Some damage was also caused to banana fields on the north side of Jamaica. Advices issued on the 23d noted the presence of the more southern storm and stated that the northern disturbance would move west-northwest in the region of the Bahamas; also that rough water would be experienced in Cuban waters and probably as far south as Jamaica. During the 24th the southern provinces of Cuba were visited by heavy winds and rains that caused considerable property damage and in the afternoon a wind velocity of 60 miles an hour from the northeast was reported at Havana. On that date advices were issued that the storm would move west-northwest toward the southeastern portion of the Gulf of Mexico and vessels were cautioned to avoid those waters.

On the 25th the steamship *Cartago* was obliged to heave-to thirteen hours in the Yucatan Channel with wind blowing at an estimated velocity of 100 miles an hour, beginning in the morning from the northeast and shifting shortly after noon to east by southeast and continuing from that quarter during the afternoon. The position of the *Cartago* in the channel, twenty-five miles off the Yucatan coast, with hurricane winds, and high seas that dashed over the ship, and a current from the Gulf running in an opposite direction, was one of extreme peril. Damage, however, was of a minor character. The morning of the 26th the captain sent an account of the storm by wireless to New Orleans, via Burrwood, La. This was the first instance of a storm experience at sea that was transmitted in season to be utilized in current forecast work. The distance between the ship and the receiving station was about 500 miles.

Following a west-northwest course from the Yucatan Channel the hurricane center reached a position in the Gulf off and probably southeast of the mouth of the Rio Grande River by the morning of the 27th and moved thence inland near the mouth of the Rio Grande, attended by excessive rains that caused an enormous loss of life and property by flood in northeastern districts of Mexico. The following extracts from a report by J. L. Cline, Weather Bureau Observer at Corpus Christi, Tex., indicates the character of the wind and seas that were experienced on the southern Texas coast that was covered by the north, or dangerous, semicircle of the hurricane:

The barometer fell slightly during the afternoon and night of the 26th. On the 27th it was comparatively low and oscillating and reached the lowest reading, 29.73 inches, at 4:30 p. m. The wind was from the northeast, occasionally shifting to east, and thunderstorms came from the southeast. The wind reached a maximum velocity of 66 miles from the east at 2:28 p. m., and 48 miles an hour from the east was reached at 2:53 a. m. of the 28th. The wind subsided during the evening and night of the 28th. Unusually high tides and rough seas prevailed on the 27th and 28th. Low lands on Harbor, St. Joseph, Mustang, Padre, and other islands along the Gulf coast south and east of Corpus Christi from St. Joseph Island south to the mouth of the Rio Grande were inundated. The water in Corpus Christi and Neuces bays was higher than for many years and reached a maximum height about 8:30 a. m. of the 28th. The water covered low lying portions of Corpus Christi, and even where the land is comparatively high along the bay front in central and northern portions of the city, waves would occasionally dash over the bank. A number of wharves and piers were damaged. All low lands or "flats" north and northwest of the city, bordering on Neuces Bay, were submerged to a depth of 1 to 3 feet. The water receded slowly during the 29th. People living on the low islands along the Gulf state that the warnings of the Bureau were timely and enabled them to reach points of safety. This accounts for the fact that no lives were lost on the Texas coast during the passage of this tropical storm.

A special, dated August 30, from Point Isabel, Tex., to the Corpus Christi Herald reads as follows:

The people who were at Tarpon Beach are loud in their praises of the United States Weather Bureau, and say that had it not been for the warnings sent out by the Bureau that everyone of them might have been drowned. As it was, they received warnings in time to seek safety in the quarantine station, where they all remained until the storm was over.

Messages received during the 27th from the Point Isabel Life-Saving Station on Brazos Island, at the mouth of the Rio Grande River indicated the character of the storm at that point. The first message was sent in the morning and stated that the crew of the station had saved everybody at Tarpon Beach. A later message, received by the Superintendent of the Ninth District Life-Saving Service at Galveston was as follows:

This vicinity struck by a violent hurricane. Keeper and crew compelled to abandon station. Stopped at Tarpon Beach and rescued all people in surf boats and brought them over to Point Isabel. Station in a dangerous condition. Keeper and crew still at Isabel. Heavy weather.

In reply to a message from the Superintendent for further information the Keeper reported about 9 p. m. as follows:

People and crew left the station at daylight, at which time seas were breaking against the station and over Tarpon Beach. Rescued everybody. Unable to return to station this day. Station has not been sighted on account of hurricane since crew left. Hurricane still blowing and sea raging.

The value of advices and warnings issued in connection with this storm may be inferred from the fact that reports fail to show the loss of a single vessel along or near its course, that extended from the eastern islands of the West Indies to the western course of the Gulf of Mexico; neither do reports indicate that any vessel that cleared from United States or West Indian ports ran into the hurricane.

From the 27th to 30th a shallow barometric depression advanced from the Caribbean Sea south of Haiti northwestward to the Florida Peninsula and at the close of the month was central off the northeast Florida coast. This was the last of a series of barometric depressions of greater or less intensity that appeared over the tropical and subtropical regions of the Atlantic and Gulf of Mexico during June, July, and August and moved thence westward or northwestward. During the closing days of August pressure conditions over the Caribbean Sea resumed a normal aspect, and the first summer high barometer area of any considerable magnitude advanced from the British Northwest Territory to the Atlantic seaboard attended by temperature falls of 20°, or more, over the interior where temperature had been almost uninterruptedly high during July and August. Warnings for frost in the cranberry districts of Wisconsin were issued for the nights of the 28th and 29th and were verified, and frost occurred, as forecast, in northeastern New York and the interior of Maine, New Hampshire, and Vermont on the morning of the 31st.

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	12	66.4	− 0.8	+ 2.8	+ 0.4
Middle Atlantic	16	71.4	− 1.4	+ 8.7	+ 1.1
South Atlantic	10	77.9	+ 0.2	+11.1	+ 1.4
Florida Peninsula*	8	82.4	+ 0.6	+15.9	+ 2.0
East Gulf	11	81.0	+ 1.8	+ 9.3	+ 1.2
West Gulf	10	83.6	+ 2.8	+13.5	+ 1.7
Ohio Valley and Tennessee	13	76.1	+ 1.3	+ 6.7	+ 0.8
Lower Lakes	10	69.4	0.0	+ 1.9	+ 0.2
Upper Lakes	12	68.6	+ 2.6	+ 7.0	+ 0.9
North Dakota*	9	68.8	+ 2.8	− 1.1	− 0.1
Upper Mississippi Valley	14	76.8	+ 4.0	+ 4.2	+ 0.5
Missouri Valley	12	78.5	+ 4.7	+ 7.1	+ 0.9
Northern slope	9	69.1	+ 2.3	− 2.4	− 0.3
Middle slope	6	78.6	+ 3.4	+ 6.6	+ 0.8
Southern slope*	8	81.7	+ 2.2	+12.2	+ 1.5
Southern Plateau*	11	77.1	− 0.6	− 5.1	− 0.6
Middle Plateau*	10	70.4	+ 1.3	+ 3.9	+ 0.5
Northern Plateau*	12	66.9	+ 0.1	− 3.8	− 0.5
North Pacific	7	59.6	− 1.5	−10.3	− 1.3
Middle Pacific	5	65.6	− 1.2	− 2.4	− 0.3
South Pacific	4	70.7	+ 0.2	− 1.3	− 0.2

*Regular Weather Bureau and selected cooperative stations.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	12	2.53	66	− 1.3	− 0.9
Middle Atlantic	16	3.08	69	− 1.4	+ 0.9
South Atlantic	11	5.40	88	− 0.7	− 3.9
Florida Peninsula*	8	8.25	122	+ 1.5	+ 2.0
East Gulf	11	4.86	100	0.0	+ 7.0
West Gulf	10	2.27	76	− 0.7	+ 9.1
Ohio Valley and Tennessee	13	2.29	66	− 1.2	+ 3.0
Lower Lakes	10	2.08	70	− 0.9	+ 2.7
Upper Lakes	12	2.88	97	− 0.1	+ 0.9
North Dakota*	9	3.05	136	+ 0.8	+ 0.7
Upper Mississippi Valley	15	2.46	58	− 1.8	+ 0.6
Missouri Valley	12	1.88	56	− 1.6	+ 1.1
Northern slope	9	0.74	60	− 0.5	+ 0.8
Middle slope	6	1.16	47	− 1.3	− 2.5
Southern slope*	8	1.41	59	− 1.0	− 6.3
Southern Plateau*	11	3.06	196	+ 1.5	0.0
Middle Plateau*	10	1.45	193	+ 0.7	+ 0.3
Northern Plateau*	12	0.32	62	− 0.2	− 0.1
North Pacific	7	0.76	100	0.0	− 2.0
Middle Pacific	7	T.	100	0.0	+ 6.7
South Pacific	4	T.	100	0.0	+ 5.2

*Regular Weather Bureau and selected cooperative stations.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	75	− 7	Missouri Valley	64	− 3
Middle Atlantic	71	0	Northern slope	56	+ 4
South Atlantic	81	− 1	Middle slope	59	0
Florida Peninsula	82	+ 2	Southern slope	61	0
East Gulf	78	− 2	Southern Plateau	50	+ 8
West Gulf	69	− 6	Middle Plateau	47	+14
Ohio Valley and Tennessee	73	+ 1	Northern Plateau	39	− 3
Lower Lakes	68	− 3	North Pacific	74	+ 7
Upper Lakes	76	+ 1	Middle Pacific	58	− 9
North Dakota	71	+ 7	South Pacific	63	− 3
Upper Mississippi Valley	69	− 1			

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	17	54	e	Pierre, S. Dak.	6	50	se.
Charleston, S. C.	16	50	nw.	Pt. Reyes Light, Cal.	20	53	nw.
Corpus Christi, Tex	27	56	e.	Do	22	54	nw.
Detroit, Mich.	15	60	nw.	Do	23	50	nw.
Indianapolis, Ind.	27	58	s.	Do	31	54	nw.
Mt. Tamalpais, Cal.	22	66	nw.	Sand Key, Fla.	24	56	se.
Pensacola, Fla.	19	63	s.	Do	25	54	se.
Do	23	60	se.	Tatoosh Island, Wash.	25	52	s.
Do	28	53	n.				

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.2	+ 0.2	Missouri Valley	3.0	− 1.1
Middle Atlantic	4.6	− 0.5	Northern slope	3.2	− 0.7
South Atlantic	4.8	− 0.4	Middle slope	4.3	+ 0.5
Florida Peninsula	6.2	+ 1.0	Southern slope	4.1	+ 0.2
East Gulf	4.8	− 0.4	Southern Plateau	4.4	+ 0.7
West Gulf	3.8	− 0.2	Middle Plateau	4.0	+ 0.7
Ohio Valley and Tennessee	3.9	− 0.6	Northern Plateau	2.0	− 0.3
Lower Lakes	4.0	− 0.6	North Pacific	4.2	− 0.4
Upper Lakes	5.1	+ 0.4	Middle Pacific	2.9	− 0.7
North Dakota	3.3	− 0.7	South Pacific	1.8	− 1.0
Upper Mississippi Valley	3.4	− 0.8			

RAINFALL IN JAMAICA.

Through the kindness of Mr. Maxwell Hall, meteorologist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following data:

Comparative table of rainfall.

[Based upon the average stations only.]

AUGUST, 1909.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1909.	Average.
			Inches.	*Inches.*
Northeastern division	25	17	8.60	7.57
Northern division	22	41	6.15	4.44
West-central division	26	20	10.78	9.52
Southern division	27	26	7.03	5.20
Means	100		8.14	6.68

The rainfall for the island for the month of August was therefore an inch and a half above the average. The heaviest rainfall, 19.90 inches, was recorded at Glasgow Estate, and the least was 1.23 inches, at Pedro Plains.

RIVERS AND FLOODS.

There were no floods of great consequence in the United States during the month. Heavy rains from the 1st to the 3d, inclusive, over the South Atlantic States caused decided rises in the rivers of the Carolinas and Georgia and flood stages in the Wateree and Santee rivers. Warnings were issued in ample time to protect all interests, and no damage was done as the waters were not sufficiently high to injure crops.

The great rivers of the country fell steadily, as a rule, but there was sufficient water for purposes of navigation in nearly all localities.

Torrential rains in the mountain districts of Colorado, New Mexico, and Arizona, from the 16th to the 18th, were soon followed by swollen streams that filled the canons and arroyos, and overflowed banks generally. In some places in the Canon of the Arkansas River in Colorado the stages were the highest of record, and the total losses were about $250,000, divided as follows:

Property other than crops	$170,000
Crops	25,000
Soil erosion, or deposit	5,000
Suspension of business	50,000
Total	$250,000

As is usual in floods of this character, the railroads were the principal sufferers. Owing to the extreme rapidity with which these mountain floods originate and move, it is impossible to forecast their approach, and therefore there were no warnings issued except for that portion of the Arkansas River from Salida to Pueblo, Colo.

The terrible disaster that visited the city of Monterey Mexico, on August 28 was due to an enormous rise in the Santa Catarina River that traverses the narrow valley in which the city of Monterey is situated. A tropical storm that had moved across the Gulf of Mexico and had reached the mainland on the 27th was the exciting cause, and for three days an enormous